



natureplus e.V.

Guideline 0111

Blow-in insulating materials from straw

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for the awardance of the eco-label

0 Introduction

The International Association for Sustainable Building and Living – natureplus e.V. – has set itself the goal, through the awardance of a quality label (eco-label), of promoting the use of those construction products which are especially suited to achieving the goal of economic sustainability. The three classic pillars of sustainability (the environment, social aspects and the economy) are reflected in natureplus's the three fundamental requirements: the environment, health and functional quality.

Every construction activity encroaches upon the natural environment and is connected with the consumption of limited resources. Our responsibility towards future generations requires us to undertake every effort to reduce these encroachments to the lowest level possible and to limit our use of resources to a necessary minimum. In view of the foreseeable exhaustion of the reserves of fossil fuels, for example, and the dangers to the earth's climate, such an approach is the only possible means to ensure sustainable and socially equitable development. For the building sector this means promoting the use and application of construction products which help to minimize the consumption of fossil fuels and limited resources. It is natureplus's intention to help promote the commercial success of those products which fulfil these demands.

Energy-saving building methods and the avoidance of uncontrolled ventilation facilitates the accumulation of volatile chemical compounds in the interior air that are emitted by building products and the inventory contained within the building. This presents a(n) (avoidable) danger to the health of the occupants. Also, the accretion of chemical contaminants (especially phthalates/plasticisers) from building products on house dust, the increasing use of biocides in everyday products and the dangers posed by mould growth due to negative product characteristics give rise for concern. An increasing proportion of the population are exhibiting reactions, such as allergies, to the negative health-related effects of these construction products. natureplus therefore evaluates the compatibility of construction products, especially in the usage phase, according to strict standards in order to actively promote those materials which pose no risk to health and are, in addition, conducive to a healthy room climate.

The natureplus®-Eco-label is an award for construction products which meet the highest standards of sustainability by exhibiting the best possible performance in terms of the environment, health and functionality. Scope of the assessment is the building material as raw material and as component. Only the best products in a particular product group are eligible for certification in order to act as an orientation for all building professionals and consumers towards the promotion of a culture of sustainable building. The natureplus®-Eco-label has anticipated the requirements of construction products of the European Construction Products Directive EU CPR 305/20111: In the future this regulation requires a declaration of performance with evidence of the sustainable use of natural resources and of compliance with requirements in terms of low impact, over their entire life cycle, on the environmental quality or on the climate, energy-efficiency and the hygiene, health and safety of people. The natureplus®-Eco-label already provides these proofs of performance in relation to the essential characteristics of construction products. This is gauged by natureplus according to criteria and requirements which, as a rule, far exceed the legal requirements and as a minimum comply in each case with the strictest recognised standards applicable.

The natureplus®-Eco-label is classified as a Type I environmental label as per ISO 14024, taking into consideration the EU Ecolabel Regulation and the EMAS regulation on environmental auditing, and is valid across the whole of Europe according to uniform criteria. The pre-requirements for a construction product to be certified with the natureplus®-Eco-label are its especially high performance characteristics in terms of the environment, health and sustainability. The main focuses are on the protection of limited resources by the minimisation of the use of petrochemical substances, sustainable raw material extraction/harvesting, resource-efficient production methods and the longevity of the products. Therefore, building products made from renewable raw materials, raw materials which are unlimited in their availability or from secondary raw materials will be favoured for certification.

I Application Areas

The following award criteria contain requirements for awarding the natureplus® eco-label to blow-in insulating materials made of straw. The award criteria is to be applied exclusively to the mentioned product group.

2 Award Criteria

The prerequisite for a product to be awarded the natureplus® quality label in accordance with these guidelines is compliance with the following award guidelines:

- GL-5001 Chemicals Directive
- GL5002 Origin of Wood and Wood Production
- GL-5004 Transparency and Social Responsibility
- GL-5010 Low-emission building products
- GL-5020 Climate compatibility and energy efficiency

2.1 Functional Suitability

The product meets the requirements for the suitability of application by holding the state-specific or the European technical approval.

Compliance with the usability requirements associated with this approval must be ensured by internal or external monitoring and the relevant evidence, e.g. monitoring/quality assurance protocols and test reports for factory production control, certificate of conformity from the notified monitoring body, must be submitted. The verification must take the following test parameters into account, whereby the specified requirements for the building physics characteristics apply:

- Nominal value of thermal conductivity according to EN 12667 or equivalent standard: $\lambda_{10, \text{dry}, 90/90} \leq 0.045 \text{ W/m K}$
- Building material class according to EN 13501-1 at least E
- Bulk density ρ 90 kg/m³ 115 kg/m³
- Settling behaviour under vibration (SV) and under vibration (SD) or under cyclical temperature and humidity loading (Scyc) in accordance with EN 15101-1 or equivalent standard¹
- Fiber dimensions: Fiber width max. 5 mm, fiber length max. 30 mm
- Moisture content according to EN ISO 12571 $u \leq 15\%$
- humidity conversion factor
- Resistance to micro-organisms according to EN 15101-1 or equivalent standard¹

In case the product is supplied to countries in which other requirements apply as the ones in the standards mentioned so far, these requirements must be met as well. The manufacturer states the countries where the product is distributed and provides official certification by approved testing institutions to confirm compliance with the requirements.

2.2 Composition, Forbidden Substances, Substance Restrictions

At least 95 % by mass of the product must consist of renewable raw materials. Excluded from this are products with increased fire protection properties. These must consist of at least 85 wt. % renewable raw materials.

The following substance bans and restrictions apply in addition to those listed in the natureplus® Chemicals Directive GL-5001:

- No organohalogen compounds may be added
- No synthetic-organic flame retardants may be added. Products classified in building material class D or higher according to EN 13501-1 or equivalent may contain up to 15 % by mass of mineral flame retardants.
- The use of boron compounds is not permitted.

- The use of biocides is not permitted. Mineral raw materials with a biocidal effect which meet the requirements of the Chemicals Directive GL-5001 are excluded from this. The ecological and human-toxicological harmlessness and the additional technical benefit of these components must be proven. The definition of "biocide" corresponds to the definition in Regulation (EU) No. 528/2012 on the placing on the market and use of biocidal products.

The product is subject to laboratory analyses as laid down in section 3 and has to comply with the limit values stated therein.

2.3 Raw Material Sourcing, Production of Preliminary Products, Production

A certificate of origin must be provided for all renewable raw materials.

The manufacturing company undertakes to obtain declarations of conformity from its raw material suppliers that no synthetic pesticides are used in the cultivation of the vegetable fibres.

If possible, internationally recognised labels should be used as evidence. Compliance with the criterion is additionally checked by laboratory tests. For this purpose, the product to be awarded is comprehensively screened for pesticide residues on the basis of L 00.00-115/1. This method allows the detection of approx. 500 pesticides in biogenic products. If a pesticide is detected, it is assessed in individual cases whether the result can be tolerated or whether measures are necessary to avoid it. This assessment is based on the toxicological classification of the pesticide, analogies to the pesticides already evaluated and the suspected source of contamination. For products in which pesticide residues have been detected, more frequent control measurements may be established, even if the limit values in Section 3 have not been reached.

The manufacturer shall ensure, through delivery specifications, incoming raw material controls and product quality controls, that

- the amount of weeds and residual grain in the straw is as low as possible
- the straw has no active mould infestation
- the moisture content of the straw is low ($\leq 15\%$)
- the straw is transported dry and stored protected from the weather and rising soil moisture until it is ready for processing
- for factory processing:
 - the bulk density is not less than 90 kg/m^3 and not more than 115 kg/m^3 .
 - the maximum fibre width is 5 mm and the maximum fibre length is 30 mm
 - the product is installed dry and settling-proof.

When installed, the product quality is significantly influenced by the moisture properties of the selected overall construction. In this context, the planning and processing requirements in Section 2.8 Processing apply.

Compliance with the criteria for "transparency and social sustainability" throughout the entire supply chain is to be achieved in accordance with natureplus® Certification Criteria GL-5004. In addition to the proofs mentioned in GL-5004, awards with demeter or Naturland are suitable.

The manufacturer must demonstrate that a hazardous substance management according to national standards and regulations is available at the production facility for employee protection. Information on dust release and compliance with general dust limit values must be included therein. Where compliance with the general dust limit values or other occupational limit values cannot be guaranteed despite technical and organisational measures, personal protection equipment must be available. It must be aimed for a minimisation of avoidable burdens of the employees.

2.4 Usage

The product must not exhibit any unpleasant or foreign smells or odours. The emissions during use have to be in compliance with the limit values according to section 3.

Emissions must not exceed the natureplus limits according to section 3 during the use phase. (see section 3 and RL5010)

2.5 Recycling/Disposal

The manufacturer must submit a dismantling concept with the aim of high-quality reuse of the product and provide proof of existing recycling processes, e.g. suction.

The product must be suitable for safe disposal in a waste incineration facility.

2.6 Ecological Parameters

All products in this product group must be manufactured in such a way that the ecological parameters listed in RL 5020 are fulfilled.

2.7 Declaration

The product packaging should display a full declaration of the input materials listed, analogue to the EU-Cosmetic Regulations, according to the declining mass percentage. If it is not possible to display this information directly on the product packing, it should be provided with the product in a technical datasheet or sales leaflet (in English or in the national language). If intermediate/preliminary products or formulations are used as input substances and the proportion present in the final product is >0.1 M-%, then all the substances used within these must also be taken into account for the declaration.

For naming the input materials as part of the declaration the following applies:

- More than 1 M-% - designation of the substance in question
- Less than 1 M-% - at least a functional designation (e.g. "moth proofing agent")

Furthermore, it is obligatory to provide the following information in a suitable form to the consumer or user (eg. online):

- Instructions for use and safety precautions
- Indications for storage and disposal
- Batch numbers
- City/town and country of production
- Indication of geographical origin of the key input material

When using ingredients with an environmentally hazardous potential, the manufacturer must indicate at an appropriate place which measures are to be taken within the framework of dismantling and demolition work to protect the environment (e.g. controlled dismantling).

In addition, the following product-specific information must be made available to the consumer or user:

- Marking in accordance with the building authority approval and, if not included therein,
- Product characteristics according to section 2.1

2.8 Processing and Installation

The product may be processed at the factory or on site.

The manufacturer must provide detailed processing guidelines and technical product information, including design examples, in particular for the flow-free and condensate-free design of components. The manufacturer must provide proof of the moisture-technical suitability of the design.

The manufacturer must demonstrate whether working procedures avoiding dust release are available for the processing of the product. If this is the case, these procedures are to be recommended and suitably presented within the processing guidelines. If compliance with the general dust limit values might not be guaranteed, wearing personal protection equipment must be recommended.

This information must also be appropriately displayed on the packaging (pictograms and text). Delivery may only be made to suitably trained processors. The product may only be used by trained users within the company where it is to be used and in compliance with occupational health and safety conditions.

The manufacturer must provide the processor with sufficient information on how the product is to be introduced in a settlement-safe manner.

The manufacturer must oblige the processor to use a method by which the results of each processing operation can be checked.

2.9 Packaging

The packaging used must be recyclable. The manufacturer must belong to a recycling system, if one exists for the corresponding material.

Paper and cardboard packaging must be made from recycled paper. Alternatively, paper from sources as per GL-5002 is also permitted.

Plastic packaging must be made from polyolefins. PET, polystyrene or polycarbonates are allowed exceptionally in reasonable cases.

PVC packaging is generally not permitted.

Packaging must not contain biocides.

The natureplus certification mark has to be printed on the packaging after it has been awarded.

3 Laboratory Tests

The products are subject to laboratory analyses to test for harmful substances and undesirable ancillary ingredients. A representative sample is collected during the production audit. If the sample collection cannot be conducted by a natureplus examiner, an independent person designated by natureplus can collect the sample. For products with different sizes but the same composition, a single sample is sufficient.

3.1 Volatile Organic Compounds VOC / TVOC

To check the emission of VOC and to determine the TVOC and TSVOC, an emission chamber test is carried out with the product. Measurements are usually performed after 3 and 28 days. If a low VOC emission is to be expected, a termination measurement can

also be carried out after 7 days. The test-chamber examination is performed according to the current version of natureplus guideline 5010. The product must comply with the limit values specified in guideline 5010.

3.2 Element Analyses

The product is subject to an element analysis to determine the content of harmful elements and to check for undesirable contaminations. The measurements have to be in compliance with the limit values. The analysis is performed according to the current version of the test method TM-02 metals.

Element	Limit value [mg/kg]
Arsenic (As)	≤ 2
Cadmium (Cd)	≤ 0,5
Cobalt (Co)	≤ 5
Chrome(Cr)	≤ 10
Copper (Cu)	≤ 50
Mercury (Hg)	≤ 0,2
Nickel (Ni)	≤ 10
Lead (Pb)	≤ 5
Antimon (Sb)	≤ 2
Tin (Sn)	≤ 10
Thallium (Tl)	≤ 1
Zinc (Zn)	≤ 500

3.3 Other Analyses

Halogenic organic compounds

Test parameters	Limit values	Unit	Method
Halogenic organic compounds: AOX/EOX	≤ 1	mg/kg	TM-03 Halo

Odour

Test parameters	Limit values	Unit	Method
Odour	≤ 3	Odour intensity	TM-04 Odour

Flame retardants

Test parameters	Limit values	Unit	Method
Flame retardants (organophosphates) -single TMP, TEP, TPP, TiBP, TBP, TPhP, TKP, TEHP, TBEP, TCEP, TCPP, TDPP	≤ 1	mg/kg	

Pesticides

Test parameters	Limit values	Unit	Method
Total pesticides	≤ 1	mg/kg	TM-05 Pesticides
Individual pesticides Organochlorine pesticides: Aldrin, Chlordane, DDD, DDE, DDT, Dichlofluanid, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Lindane, Pentachlorophenol Organophosphate pesticides: Dimethoat, Fenthion, Parathion-methyl, Parathion-ethyl, Phosalon Pyrethroids: Cypermethrin, Lambda-Cyhalothrin, Permethrin Other: Benomyl, Carbendazim, Prochloraz	≤ 0,5	mg/kg	TM-05 Pesticides

4 Appendix**Test methods**

TM-01 VOC : Volatile Organic Compounds VOC/TVOC, formaldehyde, acetaldehyde and TSVOC: DIN EN ISO 16000 series expanded by the natureplus implementation rules.

TM-02 Metals: ICP-MS measurements according to DIN EN ISO 17294-2, supplemented with the natureplus implementation rules and a sample preparation adjusted to the issue analysed.

TM-03 Halo: Halogenic organic compounds after combustion, determined by microcoulometry according to the natureplus implementation rules "AOX/EOX".

TM-04 Odour: natureplus implementation rules "odour intensity", 6-degree grading scale 24h after loading the test chamber

TM-05 Pesticides: DFG S 19 extended by natureplus implementing regulations

TM-08 Foreign fibres and foreign substances: scanning electron microscopy SEM

TM-09 Monomeric isocyanates: 24h after test chamber loading

TM-10 PAH: HPLC / GC-MS, sum according to EPA

natureplus® Certification Criteria GL-5001 Chemicals Directive

natureplus® Certification Criteria GL-5004 Transparency and Social Responsibility

natureplus® Certification Criteria GL-5010 Low-emission building products

natureplus® Certification Criteria GL-5020 Climate compatibility and energy efficiency

European Assessment Document EAD 040138-01-12-01 In-situ formed loose fill thermal and/or acoustic insulation products made of insulation products made of vegetable fibres

EN 12667 Thermal performance of building materials and building products - Determination of thermal resistance by the plate and heat flow measuring plate method - Products with high and medium thermal resistance

EN 13501-1 Classification of construction products and construction types with respect to their reaction to fire - Part 1: Classification with results from reaction to fire tests of construction products

EN 15101-1 Thermal insulation products for buildings - In-situ produced cellulosic (LFCI) thermal insulation products - Part 1: Specification for products before installation

EN ISO 12571 Thermal and moisture performance of building materials and building products - Determination of hygroscopic sorption properties

EN ISO 17294-2 Water quality - Application of inductively coupled plasma mass spectrometry (ICP-MS) - Part 2: Determination of selected elements including isotopes of uranium

EU Cosmetics Regulation (EC) No 1223/2009 of the European Parliament and of the Council of 30 November 2009 concerning cosmetic products

ISO 846 Plastics - Determination of exposure of plastics to micro-organisms (ISO/DIS 846:2018)

L 00.00-115/1:2018-10 Examination of foodstuffs - New version of the multi-method for the determination of pesticide residues in plant foodstuffs using GC-MS and/or LC-MS/MS after acetonitrile extraction/distribution and purification with dispersive SPE (QuEChERS) (New version of method L 00.00-115 by the Working Group on Pesticides in accordance with § 64 LFGB)

Straw Construction Guideline SBR-2014, Fachverband Strohballenbau Deutschland e.V., Verden, 22.11.2014, available at <http://fasba.de/>

Stroh-Cert - Certification, Logistics and Quality Management for Straw Bale Construction, Reports from Energy and Environmental Research 36/2011, R. Wimmer, H. Hohensinner, S. Eikemeier, Publisher: BMVIT, available at <https://nachhaltigwirtschaften.at/de/hdz/projekte/stroh-cert-zertifizierung-logistik-und-qualitaetsmanagement-fuer-den-strohballenbau.php>

Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 on the placing on the market and use of biocidal products